Appeal of Adjustments in Public Benefit Ratio Review: The South Sacramento County Ag Program

A Model Multi-Benefit Project – Recycled Water, Groundwater Storage, Conjunctive Use and Ecosystem Enhancement in Southern Sacramento County

REGIONALSAN
TAKING THE WASTE OUT OF WATER
Sacramento Regional County Sanitation District

Program Summary

The South Sacramento County Ag Program is an exceptional opportunity to proactively restore and manage groundwater, while improving stream flows in the lower Cosumnes River, enhancing riparian habitats and wetlands, sustaining prime agricultural lands, and improving regional water supply reliability. The Program is being developed by Regional San and has the potential to deliver up to 50,000 acre-feet per year (AFY) of drought-proof recycled water to irrigate more than 16,000 acres of permanent agriculture and habitat conservation lands near the Cosumnes River and Stone Lakes Wildlife Refuge. Essentially, this recycled water would be used in-lieu of pumping groundwater. Additionally, the Program proposes to implement wintertime irrigation and wildlife-friendly recharge basins in the project area where the soils are suitable, to provide further groundwater recharge.

Key Benefits of the South Sacramento County Ag Program:

- Improves water quality by restoring groundwater levels and increasing in-stream flows in the Cosumnes River.
- Restores depleted groundwater levels up to 35 feet within 15 years and helps achieve compliance with the Sustainable Groundwater Management Act (SGMA).
- Increases groundwater storage capacity by approximately 245,000 acre-feet within 10 years, and approximately 450,000 AF in 40 years.
- Supports and increases riparian and wetland conditions on over 5,000 acres.
- Supports a variety of threatened species, such as Swainson's Hawk, Sandhill Cranes and Giant Gardner Snake.
- Increases frequency of Cosumnes River instream flows to support fall-run Chinook Salmon.

Not only is the South County Ag Program supported by a broad group of stakeholders (including The Nature Conservancy, Environmental Defense Fund, Clean Water Action, Trout Unlimited, the Farm Bureau, local water purveyors and Sacramento Central Groundwater Authority), but it also has an approved US Bureau of Reclamation Feasibility Study and a final Environmental Impact Report. The public ecosystem benefits of the Program are both impressive and extensive as described in the application submittal and below.

Overview

Regional San has reviewed the California Water Commission's (CWC) Public Benefit Ratio Review package and associated spreadsheets. The methodologies used for the public physical benefits associated with the South County Ag Program were all accepted by the Commission's reviewers, with the one exception of recreation benefits. However, the monetized benefits for all categories were adjusted by reviewers. Public benefits for all Water Storage Investment Program (WSIP) applicants were reduced significantly by reviewers and no applicant had a Public Benefits Ratio (PBR) of greater than one after the initial technical review. The South County Ag Program had the highest PBR (0.75) following initial technical review. Restrictions on methodologies and valuations by the regulations and the technical reference are cited as the justification for reductions in benefits. The appealed public benefits ratio and overall project cost/benefit ratio contained in this appeal conform to the reviewers' comments and the restrictions imposed by the regulations, but do not necessarily reflect Regional San's own internal evaluations of the Program. Table 1 provides a summary of the adjusted benefits, costs, PBR, and adjusted eligible request.

Table 1: Applicant-Submitted, Reviewer-Adjusted, and Applicant-Appealed Benefits, Costs, and PBR[a]

	Applicant Originally Submitted			CWC Staff Estimates: Benefits and Costs			Regional San Appeal: Benefits and Costs		
	Benefits	Requested Capital	Summary	Benefits	Eligible Capital Allocation	Summary	Benefits	Eligible Capital Allocation	Summary
WSIP Eligible Capital		$304.0			$280.5			$280.5	
Ecosystem	$320.4	$117.2		$182.0	$182.0		$233.0	$233.0	
Water Quality	$569.5	$208.4		$47.7	$47.7		$47.7	$47.7	
Flood	$0.0	$0.0		$0.0	$0.0		$0.0	$0.0	
Emergency response	$0.0	$0.0		$0.0	$0.0		$0.0	$0.0	
Recreation	$6.7	$2.5		$0.0	$0.0		$0.0	$0.0	
Total Public Benefit	$896.6	$328.1		$229.6	$229.6		$280.7		
Federal and Other State	$0.0	$0.0		-$112.4			-$112.4		
Non-Public Benefit	$123.1	$45.1		$15.0	$50.9		$61.7	$0.0	
Total	$1,019.7	$373.1		$244.7	$280.5		$342.4	$280.5	
Total Cost			$373.1			$425.5			$424.0
Original Request			$304.0						
Eligible Funding						$229.6			$280.5
Eligible Applicant Request									$280.5
PBR: TPB/Original Request			2.95			0.75			0.92
PBR: TPB/Revised Eligible Request									1.00

Notes:

[a]Dollar values are in millions of 2015 dollars of present value

Source for Estimates: Attachment XX: "SouthCountyAgEcon - RegionalSanAdjust"; based on CWC Reviewers' spreadsheet

Values are rounded to the nearest tenth of a million dollars for display purposes

This document provides responses to the reviewers' revisions to PBR calculated for the WSIP application submitted by Regional San for the South County Ag Program. Many of the adjustments made to the ecosystem, water quality, and recreation monetized benefits by the reviewers are uncontested by Regional San. Regional San is removing the recreation benefits (and associated valuations) from the analysis based on the reviewers' conclusions that the benefits attributable to recreation originate from ecosystem improvements that are already quantified as ecosystem benefits, such as improved flows in the Cosumnes River. Regional San is also not contesting the reviewers' adjustments to the ecological program monetized benefits associated with the Fall Run Chinook Salmon, Greater Sandhill Cranes or Vernal Pool Habitat, as well as adjustments to water quality.

However, Regional San is proposing alternative methods of calculating the monetized benefits for selected ecosystem improvements, namely: (1) wetland habitat functional improvements due to increased groundwater levels resulting from the Program; and (2) riparian forest functional improvements resulting from the Program's active restoration and management activities. Regional San's appeal for alternative methods of discounting the monetization of the above two ecosystem benefits are described in detail below. For reference, the WSIP application documents that describe the original methods of quantifying monetized ecosystem benefits are provided in Table 2 and for brevity in this appeal document, are given an alternative simplified name.

Table 2. Regional San WSIP application documents that describe the original methods of quantifying monetized ecosystem benefits. Each file is given an alternative title for referencing throughout this document.

Ecosystem Benefits Category	Described in Application Package Document File:	Referred to in this Document as:
Physical Benefits	Regional San_Conceptual Ecological Plan_A.2 Ecosystem Benefits_SecPPB.pdf	Ecological Plan
Monetized Benefits	Regional San_Monetized Public Benefits_A 3 Monetization Meth.pdf Regional San CB and Allocation_Public Non-Public A.10_SecBCMR.xls	Monetization Methods Benefits Summary Sheet

A summary of the reviewers' adjustments to Program costs and monetized ecosystem, water quality, and recreation benefits, and Regional San's responses to them, are summarized in Table 3.

Table 3. Summary of benefits as originally submitted by Regional San and as adjusted by the reviewers. Regional San's responses and alternatives to those adjustments are included in the "Applicant-adjusted Benefits" columns.

Reviewer-adjusted Benefits					Applicant-adjusted Benefits		
Category	**Submitted Benefit**	**Total Benefit**	**Change from Submitted**	**Description of Reviewer Adjustment**	**Total Benefit**	**Change from Submitted**	**Applicant Response to Adjustment**
Ecosystem Benefits							
Fall run Chinook	$48,944,715	$63,850,000	$14,905,285	*Adjustment not contested*	$63,850,000	$14,905,285	*Adjustment not contested*
Riparian Habitat	$25,237,707	$1,660,000	-$23,577,707	Reviewer disagreed with applicant's monetized per-acre alternative costs for managed riparian forests and, as a result, discounted the proposed per-acre value to 5% based on their mis-understanding of potential improvements of riparian habitat as a result of restoration and management activities.	$23,263,245	-$1,974,462	Regional San has already conservatively estimated benefits for only 500 acres, even though the Program will increase the ecological function of wetlands on up to 3,133 acres. Applicant maintains that original per-acre habitat value of $87,818 should be used for monetization of the 500 acres, but that it alternatively could be discounted to 70% based on applicant-revised median functional increase of these habitats due to restoration and management.
Greater Sandhill Crane	$146,070,902	$56,980,000	-$89,090,902	*Adjustment not contested*	$56,980,000	-$89,090,902	*Adjustment not contested*
Wetland Habitat	$91,622,238	$49,030,000	-$42,592,238	Reviewer disagreed with applicant's monetized per-acre alternative costs for high quality wetland habitat and discounted final monetized benefit submitted by applicant by 50%.	$78,441,054	-$13,181,184	Applicant maintains that original per-acre habitat value of $150,000 is appropriate and recommends a less severe discount of 20% of the submitted monetized benefit value to account for the alternative costs of recreating the resiliency to climate change, potential for habitat connectivity, etc. provided by the improvements in groundwater conditions.
Vernal Pool Habitat	$8,506,981	$10,460,000	$1,953,019	*Adjustment not contested*	$10,460,000	$1,953,019	*Adjustment not contested*
Total Ecosystem Benefits	**$320,382,543**	**$181,980,000**	**-$138,402,543**	--	**$232,994,299**	**-$87,388,244**	--
Other Benefits							
Recreation	$6,733,793	$0	-$6,733,793	*Adjustment not contested*	$0	-$6,700,000	*Adjustment not contested*
Water Quality	$569,477,235	$47,660,000	-$521,817,235	*Adjustment not contested*	$47,660,000	-$521,817,235	*Adjustment not contested*
Public Benefit	**$896,593,571**	**$229,640,000**	**-$666,953,571**	--	**$280,654,299**	**-$615,905,479**	--

Regional San also made a correction to the Commission's reviewers' revised costs for the Pump Station Replacement Fund to reflect the duration that the fund is in place. The reviewers used 84 years for the fund, however the fund will only be added to for 50 years and then used to replace the pump.

Regional San has provided information in its WSIP application on a variety of non-Public benefits, most of which were not adjusted by CWC reviewers. The one non-Public benefit category adjusted by CWC was Water Supply Benefit. Reviewers did not contest benefits submitted by Regional San, but offset the benefits with water supply effects on Delta Exporters. The CWC reviewers used modeling output prepared by Regional San, under both 2030 and 2070 climate conditions, valuing the water at export prices over time, from $314/AF in critical years, under 2030 conditions, and $905/AF in critical years, under 2070 climate conditions. CWC reviewers thereby developed a net benefit (benefits minus impacts) of $15 Million. Regional San does not take issue with the methodology used by CWC reviewers herein, but does not share the perspective that the downstream effects of the change in operations by Regional San (with project vs. without project) should be counted against Regional San in its overall Benefit:Cost ratio or in its project cost effectiveness analysis. Regional San owns the water it discharges and is finalizing its Petition for Change to document that ownership, consistent with the analysis done for this application.

If Regional San were to have used the same methodology as CWC reviewers used to measure effects on its water supply benefit, the present value of its water supply benefit would have been $171 M, with a net value (net of effects) of $61.7 M. Moreover, water supply impacts to the Delta has already been addressed in the Program's EIR mitigation measures, and the effects on Delta Exporters is being addressed through the District's Petition for Change process. Since a change to the value of water results in a significant change to the water supply benefits, Regional San would also request that if higher values for water or ecosystem benefits are allowed to be used by other WSIP applicants, then Regional San also has the right to revise its application and apply those new values to its Project's monetized public and non-public benefits. This will ensure a fair and equitable approach is used to determine economic values for all WSIP applicants.

Non-Public Benefits and Cost Effectiveness

Although the focus of this Public Benefits Ratio review is public benefits, Regional San would like to clarify that its Project benefits include the public benefits addressed herein, the nonpublic benefits addressed partially herein, and also significant non-monetized benefits, which do not appear in calculated benefit:cost ratios. Regional San has heard from its ratepayers, and articulated by its Board, that the communities served by Regional San across Sacramento County are willing to invest in the beneficial use of recycled water. This will translate into a willingness to operate and maintain the South County Recycled Water Ag Program, over and above the State's potential investment in capital to fund the Ecosystem and other public benefits. Therefore, Regional San sees this project as cost effective for its ratepaying community; Statewide funding of the Public Benefits associated with this project will certainly help Regional San make the Non-Public benefits tangible and quantifiable.

Regional San has reviewed the Operations Review document prepared by CWC staff and team. The Operations Review found that the modeling conducted by Regional San was consistent with guidelines and had no corrections needed, and fundamentally all the public and nonpublic benefits were properly quantified. Nevertheless, several comments were presented by reviewers questioning the *precise* estimates of annual streamflow across the 84 years simulation period, groundwater banking withdrawals, and fall run chinook beneficial flow estimates with the project. Generally, it appears the reviewers comments were based upon simple calculations based upon input and output data presented in the application as opposed to the model output which reflects the model operations used by Regional San in preparing its application. In our appeal, we address each of these comments below.

Uncontested Reviewers' Values

As stated earlier, Regional San is removing the recreation benefits (and associated costs) from the analysis based on the reviewers' conclusions that the benefits attributable to recreation originate from ecosystem improvements that are already quantified as ecosystem benefits, such as improved flows in the Cosumnes River. Regional San is also not contesting the reviewers' adjustments to the ecological program costs associated with Fall Run Chinook Salmon, Greater Sandhill Cranes or Vernal Pool Habitat.

Regional San understands the Commission's use of a willingness-to-pay (WTP) model to estimate the economic benefits of the South County Ag Program's reduced salinity loading to the lower Sacramento River and Delta. The WTP value developed by the Commission represents the lowest cost in comparison to the feasible alternative cost value developed by Regional San (i.e., cost of reverse osmosis treatment to remove salts). Although Regional San maintains that its estimated cost of reverse osmosis treatment represents the real cost of removing an equivalent salt load to the lower Sacramento River and Delta as will be afforded by the South County Ag Program, it will not contest the Commission's adjusted present value economic benefit of $47.7 million. This water quality benefit is still linked to the salinity benefits provided to urban and agricultural water users and public trust resources with implementation of the South County Ag Program.

Table 2 above includes the values that are not contested.

Contested Reviewers' Values

Regional San is appealing the public benefit values adjusted by the Commission reviewers for Wetland Habitat and Riparian Habitat ecosystem benefits. Reasoning for the appeal of each benefit type is provided below.

Revised "Applicant-adjusted benefits" are displayed in Table 2 above. See Attachment 1 for calculations of revised values using the Commission's methodology for reviewing costs and benefits.

Wetland Habitat Improvement Due to Improved Groundwater Conditions

Section 2.1 of the Ecological Plan describes the habitat improvements to existing wetlands that are expected to result from the improved groundwater conditions with the Program in place. The reviewers had no issues with the methods or results of Regional San's quantification of the ecosystem

benefits for wetlands improved in this manner. The magnitude of functional improvement described in Section 2.1 of the Ecological Plan ranges from 5% to 50% and is dependent on the current condition of the wetlands (as either currently managed[1] or unmanaged) and the modeled with-program groundwater levels (within either 5 ft or 10 ft of the surface 80% of the time). These tiered levels of functional increase will be distributed across the landscape as a result of the Program, and these percentages were multiplied by the per-acre value of high functioning wetlands according to this distribution using the alternative cost method. The adjustment of monetized benefits by the reviewers was based on disagreement with Regional San's per-acre monetization of high quality wetland habitat (obtained from conservation bank managers), which was approximately $150,000 using an alternative cost approach[2] (Table 4). Based on the reviewers' belief that the monetized value of wetlands was inflated[3], they decreased the total monetized ecosystem benefit by 50%. Regional San believes these wetlands have exceptional value, as described below, and alternatively suggest that the monetized benefits should only be discounted by a maximum of 20%, instead of 50%. The revised net present value is presented in Table 4, and updated calculation methods of the monetized public benefit are included in the file "RegionalSan_WSIP_Response to Reviewer adjustments_EcoCalcs.xls".

Table 4. Wetland and Riparian Forest Mitigation Bank Credit Cost Ranges (price per credit)

Organization	Wetland		Riparian Forest		Source[4]
	Low	High	Low	High	
Westervelt Environmental Services	$130,000	$145,000	$75,000	$85,000	Personal communication with Travis Hemmen, Vice President, Business Development, Westervelt Ecological Services, Sacramento, CA
Wildlands, Inc.	$125,000	$250,000	$80,000	$125,000	Personal communication with Julie Maddox, Inside Sales Manager, Wildlands, Inc., Rocklin, CA.
National Fish and Wildlife Foundation	$150,000	$150,000	N/A	N/A	National Fish and Wildlife Foundation. Sacramento District California In-Lieu Fee Program, Exhibit F – Program Account: Financial Accounts, Fee Schedule, and Financial Reporting. Available at: http://www.nfwf.org/ilf/Pages/home.aspx
Average (2017 USD)	**$158,333**		**$91,250**		
Average (2015 USD)	**$152,378**		**$87,818**		

[1] Managed wetlands represent areas that are currently managed for conservation purposes. These areas include the Cosumnes River Preserve, land managed by The Nature Conservancy or other agencies, and the Stone Lakes National Wildlife Refuge.

[2] Public Benefit Ratio Review Summary, pg. 5: "…there is no recent cost paid per acre for wetlands anywhere in the State that exceeds $125,000, and no cost for wetland acreage in northern California exceeding $37,000 per acre, or roughly one-quarter of the applicant's alternative cost measure."

[3] Public Benefit Ratio Review Summary, pg. 5: "The South County Ag Program acreage is not of the same quality as mitigation bank acreage…"

[4] Bank managers were unable to share credit purchase contracts due to confidentiality, but non-confidential price sources and email transactions are included as 'Attachment 2_Bank credit cost examples.pdf'. Note that the full range of prices used to calculate averages is not reflected in these documents.

Defense of the original valuation of improved wetland habitats

The wetlands that will benefit because of improved groundwater conditions from the Program have exceptional value based on several factors. The Cosumnes River has had a series of concerted restoration actions that have improved the quality and quantity of habitat available to wildlife where these efforts have been focused. However, to restore additional habitat, as well as maintain past efforts to the desired level requires the reconnection of complex natural processes and the scaling of efforts to achieve large habitat patches. The wide-scale improvement in groundwater levels that are expected to result from the South County Ag Program support the natural processes that enable successful wetland restoration and conservation efforts and reconnection of wetland patches. The cost to assess, permit, implement, and ensure adaptive management to achieve these benefits without the support of improved groundwater conditions is significantly larger in Regional San's estimate than the Technical Reference costs[5]. The significant geomorphic modifications that would be required to support this new understanding in the same way as the improved groundwater conditions of the Program include significant earthmoving, flood easements, and flow improvements underpinned by complex, iterative modeling. Regional San's conservation bank approach to valuing the alternative costs of the Program's groundwater benefits is conservative compared to using the costs of wide-scale engineered solutions.

Furthermore, the overall increase in functional value of wetlands due to groundwater improvements that are expected from the Program are likely greater than the habitat protection provided by conservation banks, even when they have the highest standards of management. While banks do have a significant and unmatched degree of regulatory certainty, they are treated as static entities with no public access and no intentional efforts to aggregate large patches of complex habitat types and capture the full ecological gradient. Regional San's habitat approach is to deal with climatic uncertainty by protecting the full gradient from below sea level through the riparian zone, the oak woodlands, and the savannah and vernal uplands. This approach accommodates both sea level rise and changing temperature gradients, something that no bank has proposed. Public access would occur in coordination with the existing public management and education efforts of the Cosumnes River Preserve and Stone Lakes National Wildlife Refuge.

Riparian Habitat Improvement Due to Restoration and Management Activities

The reviewers discounted Regional San's monetized benefit of 500 acres of riparian habitat that will be maintained and/or improved through active restoration and management of targeted sites within the Program area. The reviewers' discount appears to be incorrectly based on the following interpretation of Regional San's quantification of physical benefits (described in Section 2.3 of the Ecological Plan) and monetized benefits based on alternative costs (described in the Section 3B of the Monetization Methods, see Table 2 for original file name), respectively:

[5] https://watershed.ucdavis.edu/library/role-stochasticity-and-priority-effects-floodplain-restoration

(1) the potential for improvement of ecological function on these riparian habitats to be limited to 5% because of their current ecological functionality of 95% (which is a misunderstanding of the applicant's characterization of current ecological function); and

(2) an inflated per-acre valuation of riparian habitats based on evidence of sale of similar riparian lands. Regional San's estimated value was $87,818 per acre based on the cost of comparable conservation bank credits for high quality riparian habitat (obtained from conservation bank managers; Table 4).

The economic reviewers disagreed with the per-acre value used by Regional San for monetization, and they used the rationale from their misunderstanding of the physical benefits to discount it to 5% of the original per-acre value[6]. Regional San defends their method of per-acre valuation of managed riparian forest habitats in Section 2.1 below, and maintains that their per-acre value of $87,818 should be used for monetization. Regional San also believes the economic reviewer may have misunderstood Regional San's characterization of the current ecological function of these areas and the potential for improvement in ecological function. Regional San describes in more detail how the physical benefits were quantified in Section 2.2 below, and in addition, offers an alternative to monetizing the benefits of improving 500 acres of riparian forests. The revised net present value is presented in Table 3, and the updated calculation methods for the monetized public benefit are included in the file "RegionalSan_WSIP_Response to Reviewer adjustments_EcoCalcs.xls".

Defense of the original valuation of managed riparian forests

Similar to the rational outlined in Section 1.1, high alternative costs associated with riparian forest management are based on several technical factors. The current management of riparian forests in the Cosumnes River watershed has required significant weed management actions beyond the initial planned and funded efforts. The South County Ag Program would support and enhance the existing regional multi-agency/-organization activities in order to maintain that integration and leverage the lessons learned during initial restoration efforts. The restoration and management activities of the Program support the reconnection of complex natural processes, and they increase the scaling of efforts to achieve large habitat patches, while controlling invasive weeds. Again, the alternative cost to assess, permit, implement, and ensure adaptive management to achieve these benefits is significantly larger in Regional San's estimate than the Technical Reference costs.[7] Therefore, the use of conservation bank values in this case is supported, as the Program will result in equal or greater public benefit than is offered by banks as a result of greater intensity of management, increased public access, and additional levels of analysis to ensure large patches and complex areas are protected and connected.

Revision of physical benefits quantification for active improvements to riparian forests

[6] Public Benefit Ratio Review Summary, pg. 4: "Therefore, economics reviewers concluded that the benefit should be limited to 5 percent of the present value of the alternative conservation bank purchases shown in Table 7, which is $4,391 per acre."

[7] https://watershed.ucdavis.edu/library/role-stochasticity-and-priority-effects-floodplain-restoration

As discussed above, Ecological Plan Section 2.1 described the habitat improvements to existing wetlands, including riparian forests, that will result from the improved groundwater conditions with the Program in place. Increased ecological function of wetlands are anticipated across 3,133 acres in 2030 and 2,505 acres in 2070 with the Program in place (Table 5), compared to a scenario where the Program is not implemented ("baseline"). Because the improvements are derived from improved groundwater conditions resulting from water application on nearby agricultural lands, it is assumed they will be realized to some degree on all acres that are currently categorized as wetlands and where groundwater models indicate the groundwater thresholds for improvement will be attained. Functional improvements described in Section 2.1 of the Ecological Plan are not dependent on the likelihood of landowner participation or other potential feasibility constraints because the ecological improvements are not the result of management actions.

Section 2.3 of the Ecological Plan, in contrast, describes the physical benefits that result from restoration and management activities that will be included in the Program to improve the quality of riparian forest habitats (addressed in this section). The magnitude of these benefits were misunderstood by the reviewers and are clarified and revised below.

Table 5. Number of wetland acres that will experience improvements in conditions that facilitate plant establishment and support[8] mature vegetation. Benefited acres are presented for the two climate change scenarios, and values reflect the acres improved compared to the respective 2030 or 2070 without project (baseline) condition. Acres presented in the 'Support' columns do not include acres where there is overlap with 'Establishment' acres.

	2030 Climate Change Scenario		2070 Climate Change Scenario	
Managed Wetlands	**Establishment** 10% functional improvement (Acres)	**Support** 5% functional improvement (Acres)	**Establishment** 10% functional improvement (Acres)	**Support** 5% functional improvement (Acres)
Emergent	526	162	30	644
Forested/Shrub	217	100	22	370
Riverine	68	99	2	184
Total	**811**	**361**	**54**	**1,198**
Unmanaged Wetlands	**Establishment** 50% functional improvement (Acres)	**Support** 25% functional improvement (Acres)	**Establishment** 50% functional improvement (Acres)	**Support** 25% functional improvement (Acres)
Emergent	233	848	46	444
Forested/Shrub	193	97	60	259
Riverine	244	346	38	406
Total	**670**	**1,291**	**144**	**1,109**
Grand Total	**1,481**	**1,652**	**198**	**2,307**

[8] "Support" described a condition where groundwater levels are within 10ft of the surface 80% of the time (which is supportive of existing riparian trees and vegetation). "Establishment" described a condition where groundwater levels are within 5ft of the surface 80% of the time (which enables the recruitment of new trees and other vegetation, in addition to being supportive of existing vegetation).

Data from surveys using California's Rapid Assessment Method (CRAM; California Wetlands Monitoring Workgroup, 2013) at four sites within the Program area show that managed wetland areas have relatively high functional value, with CRAM scores ranging between 65 to 89 (average of 83) (Table 6). This demonstrates that management strategies, such as weed control, tree and understory planting, intentional flooding, irrigation, wildlife browse protection, and livestock exclusion fencing can restore and maintain high quality riparian forests and wetlands. In Section 2.3 of the Ecological Plan, Regional San claimed that riparian forests would be actively restored and managed to achieve 95% functionality (equivalent to receiving a 95 CRAM score upon surveying after establishment). Regional San believes the reviewer misunderstood Regional San as claiming that Program area riparian forests are currently at a level of 95% ecological function and would only be improved 5% by restoration and active management to achieve 100% functionality.[9] Regional San was instead claiming that 95% ecological functionality would be achieved, and therefore, the monetized value was multiplied by 0.95 to calculate the public benefit. Despite the potential misunderstanding, as well as having more time to further evaluate potential benefits, Regional San is proposing to adjust the potential increase in functionality of riparian forests based on the following:

(1) 95% ecological function (or a CRAM score of 95) is higher than was found in surveys conducted in existing managed wetlands within the Program area (Table 6); and

(2) functional *increase* should not equal the achievable functional *value* (previously estimated to be 95%), because the baseline functional value is not 0% in most cases, as restored and managed riparian forests will likely have some degree of ecological value without the Program (except in cases when the wetland would no longer be supported by groundwater levels without the Program and will only be maintained by active management, discussed in more detail below). Furthermore, in some cases, a portion of the functional increase will be from the improvement in groundwater levels as a result of the Program, rather than the result of restoration and management activities.

Table 6. California's Rapid Assessment Method (CRAM) results for four survey sites within the Program benefit area. CRAM scores reflect wetland condition and stressors affecting the wetland function. Data from EcoAtlas (CWMW, 2017).

Survey Sites	Survey Year	Index Score (Maximum Score: 100)
Cosumnes Pond 11	2014	65
Cosumnes River Preserve Depression	2012	87
Tall Forest	2005	91
Wendell's Levee	2005	89

[9] Public Benefit Ratio Review Summary, pg. 4: "The file named "Regional San_Monetized Public Benefits_A 3 Monetization Meth.pdf" shows that the targeted 500 acres currently have 95 percent functionality."

Improvements resulting from active restoration and management activities of the Program are limited by factors such as operational feasibility, landowner willingness, etc. Based on these constraints, of the thousands of existing wetland acres within the Program area (Table 5), Regional San has conservatively targeted 500 acres to implement active restoration and management strategies. However, Regional San is now alternatively proposing that the estimated ecological function will be restored or maintained at 90%, rather than 95%. Based on the intensity of restoration and management, the targeted wetland acres will likely be comparable to the managed sites surveyed with higher CRAM scores in Table 6 (87, 89, and 91), the average of which is 89.

Targeting of acreages for restoration and management will be optimized to maximize benefit, and the baseline condition across these sites will vary; therefore, the increase in ecological function (to approximately 90%) will vary across the 500 acres. For example, currently un-managed sites will likely be targeted in the Program because they will provide greater improvements than currently managed sites. However, currently managed lands may also be included for several reasons (e.g., feasibility or loss of funding by current land managers), even though the magnitude of increase in ecological function will likely be smaller in these cases.

Furthermore, groundwater modeling results presented in the Ecological Plan show that groundwater levels without the Program in place would no longer be supportive of riparian forests or allow establishment of woody species across many acres by 2070 (Table 5). Even with the Program in place, some wetland acres that are supported by groundwater levels that result from the Program in 2030 will not be supported by groundwater levels in 2070. Management strategies such as irrigation or levee redesign will prevent the complete loss of ecological function of these riparian forests that would otherwise result from climate change, and the change in ecological function associated with these areas would equal the full functional value after improvement of 90%, as the functional value without the Program would be 0%. In other cases, groundwater conditions resulting from the Program will be supportive and/or allow establishment of woody riparian vegetation through 2070, and the increase in ecological function because of restoration and management will not be as large.

Detailed restoration and management plans require site-specific information and will be developed as sites are identified throughout the implementation of the Program[10]. The exact locations of the 500 acres will also be determined throughout the implementation process. Sites will be targeted based on Regional San's basin-scale opportunity assessment and prioritization analyses (described in Section 6 of the Ecological Plan), to maximize the gain in ecological function resulting from restoration and management activities. These increases are expected to vary spatially and temporally based on the potential scenarios of baseline versus with-Program conditions. For example, 90% increase in function will be realized where the wetland would no longer be supported without irrigation and other management activities, but other sites will experience more moderate increases of 50% where functionality without the Program's restoration and management intervention is at 40%. Because the areas targeted will be optimized for maximum ecological uplift, it is not anticipated that increase in ecological function will be below 50%. To capture the range of uplift that is

[10] These plans will include long-term stewardship objectives and monitoring to ensure that the future ecological conditions and functions are achieved at each individual project.

anticipated due to restoration and management activities, Regional San offers a median ecological functional value increase of 70% as a revised physical benefit value to be used for the calculation of monetized benefits across the 500 acres.

Finally, limiting these benefits to the targeted 500 acres added an additional aspect of conservatism to Regional San's benefits calculation for riparian forests. It is likely that the opportunity assessment and prioritization analyses will result in Regional San's ability to implement restoration and management practices across more than 500 acres for the currently estimated cost, because of economies of scale, positive momentum of landowner participation once the Program is in place, and strategic partnerships. Regional San asks the reviewers to consider this and the above additional examples of potential under-estimation of benefits by Regional San and that the reviewers use Regional San's recommended alternative methods of discounting the ecosystem benefits outlined in this appeal document.

Adjustment to Cost and Non-public Benefits and Costs Discussion

Project Cost Adjustment – Pump Station Fund

Regional San made a correction to the Commission's reviewers' revised costs for the Pump Station Replacement Fund to reflect the duration that the fund is in place. The reviewers used 84 years for the fund, however the fund will only be added to for 50 years and then used to replace the pump. The updated cost calculations are shown in Attachment 1 and the cells where the extra years were removed are highlighted.

Non-public Cost and Benefits of Supplies

Regional San has provided information in its application on a variety of non-Public benefits, most of which were not adjusted by CWC reviewers. The one Non-public benefit category adjusted by CWC was Water Supply Benefit. Reviewers did not contest benefits submitted by Regional San (which were based on a constant local water supply value in 2015$ at $370/AF), but offset the benefits with water supply impacts on Delta Exporters. The CWC reviewers used modeling output prepared by Regional San, under both 2030 and 2070 climate conditions, valuing the water at export prices over time, from $314/AF in critical years, under 2030 conditions, and $905/AF in critical years, under 2070 climate conditions. Slightly lower values were used for non-critical years. CWC reviewers thereby developed a net benefit (benefits minus impacts) of $15 Million. If Regional San were to have used the same methodology, , the present value of its water supply benefit would have been $171M, with a net value of $61 M (as shown in Attachment 1 and the Excel file "SouthCountyAgEcon – RegionalSanAdjust.xlsx). Moreover, water supply effects to the Delta Exporters have already been addressed in the Program's EIR mitigation measures and in discussions with Protestants through the District's Petition for Change process. Regional San's logic for the Water Supply unit values is that the value of water to the Delta Exporters would not be any higher (or lower) than to Regional San over the same time scale. Since a change to the value of water results in a significant change to the water supply benefits, Regional San would also request that if higher values for water or ecosystem benefits are allowed to be used by other WSIP applicants, then Regional San also has the right to revise its application and to apply those new values to its Project's monetized public and non-public benefits.

This will ensure a fair and equitable approach is used to determine economic values for all WSIP applicants.

Although the focus of this Public Benefits Ratio review is on public benefits, Regional San would like to clarify that its Project benefits include the public benefits addressed herein, the nonpublic benefits addressed partially herein, and also significant non-monetized benefits, which do not appear in calculated benefit:cost ratios. This non-monetized benefit is articulated as follows: Regional San has committed to invest over $2 Billion in its Echo Water Project to upgrade its Regional Wastewater Treatment Plant to produce high quality, tertiary treated effluent (nitrogen removal and filtration). Based upon surveys of its ratepayers, Regional San has determined that its ratepayers significantly value the use of this highly treated recycled water product beneficially for irrigation and groundwater recharge and habitat improvement. This will translate into a willingness to pay to operate and maintain the South County Recycled Water Ag Program, over and above the State's potential investment in capital to fund the Ecosystem and other public benefits.

Ratios in Table 1 are calculated based upon the original funding request ($304.0M), as stipulated in the regulations. Regional San would request that the funding request be revised to match the updated eligible request amount of $280.5M. This updated eligible request amount was used to update the PBR ratio to 1.0, as shown in Table 1 and calculated in Attachment 1.

Appeal Comments Based On Water Operations Review Document

Streamflow Gains

1) Under the second bullet on page 1 of 3 of the Water Operations Review for Public Benefits Ratio document, it is asserted that streamflow gains are overstated by 3,840 AFY. In preparation for the meeting with CWC staff on February 7, 2018, we asked CWC staff to please provide information on how that assertion was developed so that we could better understand the methodology and determine if Regional San can provide additional details to clarify our analysis, as appropriate."

The explanation from Staff at the meeting related to referencing the RMC/Woodard & Curran SacIWRM Technical Memorandum[11], pages 84 and 85 and the CH2M CalSim II Technical Memorandum[12] and SRCSD_Streamflow Table, and trying to reconcile the streamflow results presented in those 2 documents. Our response, which we think will clarify this misconception, is as follows.

Streamflow gains are based on a detailed analysis of water budgets within the SacIWRM integrated hydrologic model. SacIWRM is the most appropriate tool for analyzing streamflow benefits accruing from groundwater recharge projects like the South County Ag Program as it is the most detailed and accepted regional integrated hydrologic model for the Sacramento area. Details on the model are

[11] RMC / Woodard & Curran. 2017. "Integrated Groundwater and Surface Water Modeling Results Technical Memorandum." August 7. Filename: Regional San_SacIWRM ModelingTM_A.1Project Conditions_SecBCMR.pdf

[12] CH2M. 2017. "South Sacramento County Agriculture and Habitat Lands Recycled Water, Groundwater Storage, and Conjunctive Use Program Water Storage Investment Program Application Surface Water Operations and Temperature Modeling." August 7. Filename: Regional San_CALSIM_HEC5Q_ModelingTM_A.1ProjectConditions_SecBCMR.pdf.

contained in the *Integrated Groundwater and Surface Water Modeling Results Technical Memorandum*[13] and in *Sacramento Area Integrated Water Resources Model (SacIWRM) Model Development and Baseline Scenarios*[14]. Table 7 below presents the streamflow gains under the SacIWRM 2030 and 2070 conditions for the first half and second half of the simulation as well as the full simulation[15].

Table 7. Streamflow gains under the SacIWRM 2030 and 2017 conditions

	2030 Conditions – Streamflow Gains (AFY)	**2070 Conditions – Streamflow Gains (AFY)**
First Half of Simulation	18,700	15,600
Second Half of Simulation	22,800	18,700
Full Simulation	20,700	17,200

Benefits to streamflow are available through SacIWRM results, however, the use of CalSim II was necessary to tie the streamflow benefits and the results of reduced wastewater discharge to statewide reservoir operations. As SacIWRM and CalSim II operate under different hydrology (1970-2011 repeated twice for SacIWRM and 1922-2003 for CalSim II) it was not possible to directly input SacIWRM values into CalSim II. Instead, a two-part linear regression analysis was performed for each water-year type to allow for the estimation of streamflow benefits at any point in time since Project inception and at any water-year type. SRCSD_Streamflows.Table is a CalSim II input file based on the analysis performed under SacIWRM. Extensive data analysis based on SacIWRM results was performed to establish 25-years as the appropriate timing for shifting from "ramp up", where groundwater levels are rising as a result of Project recharge to "near-equilibrium", where groundwater levels are no longer rising rapidly and the majority of Project benefits are being accrued to the surface water system. This extensive analysis within SacIWRM supports the stated streamflow benefits, and these benefits are carried through to CalSim II based on the year type and timing. Therefore, because the Sac IWRM values are model outputs for streamflows predominately in the Cosumnes River, the SRCSD_Streamflow Table is an input file, and the CalSim II results are focused on downstream flow effects in the Delta, there is no quantitative difference between the results from the two models.

739 TAF is available and 814 TAF

1) Under the third bullet on page 1 of 3 of the Water Operations Review for Public Benefits Ratio document, it is asserted that 739 TAF is available for extraction and 814 TAF is extracted. In preparation for the 2/7/18 meeting with CWC staff, we asked to "please provide information on how that assertion was developed so that we could better understand the methodology

[13] RMC / Woodard & Curran. 2017. "Integrated Groundwater and Surface Water Modeling Results Technical Memorandum." August 7. Filename: Regional San_SacIWRM ModelingTM_A.1Project Conditions_SecBCMR.pdf
[14] RMC / WRIME. 2011. *Sacramento Area Integrated Water Resources Model (SacIWRM) Model Development and Baseline Scenarios*. October. Public Document. Available online at: http://woodardcurran.io/pdf/SACIWRM-Report.pdf
[15] RMC / Woodard & Curran. "Modeling Results Technical Memorandum." Filename: Regional San_SacIWRM ModelingTM_A.1Project Conditions_SecBCMR.pdf

and determine if Regional San can provide additional details to clarify our analysis, as appropriate".

The explanation from CWC staff was that they had calculated the extraction based upon reading page 7-12, Table 4 from the CalSim II Technical Memorandum prepared by Rob Leaf of CH2M. Our response, which will clarify the misconception is as follows.

The SacIWRM model is used to dynamically simulate the groundwater operations of the Project for an 84-year period (hydrologic period 1970 - 2011 repeated twice) starting at the start of operations through equilibrium condition. SacIWRM is a transient analysis of groundwater conditions from start of operations. As groundwater conditions improve with continued recharge, streamflows increase and banking operations begin and are sustained through the remainder of the period. This analysis is performed for each climate condition required to understand the potential trends in Project operations subject to climate change and the range of hydrologic conditions captured in the hydrologic period 1970 – 2011. An outcome of the SacIWRM modeling is recharge, pumping, and streamflow boundary conditions that can then be used to simulate the surface water effects, beyond the Sacramento area, of the project operations.

The CalSim II model is used to simulate the surface water effects of the Project operations for an 82-year period (hydrologic period 1922 - 2003). Unlike the dynamic analysis simulated with SacIWRM, CalSim II is used for period analysis of specific points in time during the life of the Project: at start of operations (year 0), year 10, year 20, and at near-equilibrium. CalSim II is a projected analysis of potential surface water effects due to the groundwater conditions at the selected point in time. For each point in time, assumptions of recharge, streamflows, and banking operations are varied only by climate and hydrologic conditions, whereas the point-in-time of the Project operations remains fixed. This analysis is performed for each climate condition required to understand the potential effects of Project operations at each point-in-time. The climate conditions and hydrologic period used provides results to understand the potential, variability and persistence of effects on system storage and flows, especially within the Delta. This approach is a standard and long-used approach and is the basis for the development and application of the CalSim II model by DWR, Reclamation and many other agencies involved in management of our water resources system.

The results of banking operations, as well as other operations (such as recharge and streamflow changes) vary due to the difference in analysis approaches between SacIWRM and CalSim II. Reasons for this variation are:

- Approaches used (SacIWRM dynamic simulation of each year of operations vs CalSim II projected simulation of specific points in time in the Project)
- Hydrologic periods used (SacIWRM 1970 – 2011 used twice vs CalSim II 1922 – 2003)
- Hydrologic (year type) criteria used to trigger pumping (extractions) are specified consistent across all climate conditions evaluated; due to the impacts of climate change, given the same criteria, the frequency of occurrence of pumping increases later in the life of the Project
- In addition to hydrologic criteria, storage criteria for pumping (extractions) is tracked in SacIWRM as it tracks groundwater conditions and pumping dynamically with consideration of

banked water volumes; the CalSim II model uses the hydrologic criteria for pumping only and assumes that banked water is available or not based on the point in time simulated (period analysis approach)

The variations in banking operations indicated by the comments are expected due to the approaches used for SacIWRM and CalSim II. For the analysis of each point-in-time of the Project and each climate condition, the CalSim II assumptions and inputs are consistent with the findings of the corresponding SacIWRM model simulations. Difference in approaches and metrics result in differences such as the one noted by the reviewers, but do not affect the results of the SacIWRM model simulating the likely extraction volume versus the CalSim II estimation of downstream effects of leaving water in the River during years when groundwater extraction is occurring. To force the result of one model on the other given the different approaches used would distort the true effects of the Project as presented in the Project description.

Increased flows for fall run Chinook

1) Additionally, on page 2 of 3 of the Water Operations Review for Public Benefits Ratio document under the "Increased Flows for Fall-Run Chinook" section, there is a description of the flow increases for May-August and for July, March, September, and October. We asked CWC staff to "please provide information on the climate condition analyzed for this information (2030 or 2070) and on how this information was developed".

The explanation from CWC staff was that they were referring to 2030 climate condition and referred to the RMC/Woodard & Curran TM, Tables 1 and 2, on page 61 and 62. They indicated that they took the difference in groundwater extractions by month in the with-project and without-project conditions and converted those monthly values to streamflows. Because of the time delays associated with in lieu recharge on streamflows, this approach is best done with integrated surface water -groundwater modeling, as described below.

The interaction of groundwater and surface water is complex. Depending on the location of recharge activities, benefits in streams may accrue almost immediately, in months, years, centuries, or even never. This complex relationship necessitated the use of the SacIWRM integrated hydrologic model, with its ability to simultaneously simulate groundwater and surface water processes. The benefits to streamflow cannot be assumed to be the same as the change in groundwater use within the same month. Regional San's extensive work effort to establish groundwater and surface water benefits resulting from the South County Ag Program are detailed in the *Modeling Technical Memorandum*, with additional work performed with CalSim II to establish benefits in consideration of statewide reservoir and water delivery systems. As a result, we encourage the CWC staff to use the simulated streamflows vs. their calculated values in assessing Project benefits and effects.

Model not provided to show boundary conditions

At the 2/7/18 meeting, we asked CWC staff if we could provide additional model documentation to address their comment on Page 1 of the Water Operations Review, bullet 1, regarding model calibration and boundary conditions.

The reviewers are directed to *Sacramento Area Integrated Water Resources Model (SacIWRM) Model Development and Baseline Scenarios*[16] (RMC / WRIME 2011) for information on boundary conditions, calibration, and features of the SacIWRM.

Conclusion

The South County Ag Program would provide a broad array of environmental and water supply benefits to the Sacramento region, the Delta, and the state of California. By restoring groundwater levels, this innovative project will improve stream flows in the lower Cosumnes River (a Delta tributary) and enhance habitat values in groundwater-dependent riparian forests and wetlands. The Program would provide equally important water supply reliability benefits by conjunctively managing surface and groundwater resources; using high quality recycled water for i n-lieu and wintertime groundwater recharge and using groundwater storage and banking system to ensure groundwater is available for agricultural water users during dry times. And, with a unit cost of $270 per acre-foot, the Program is much more cost effective than most other pending water storage projects in California.

In addition to providing the multiple benefits outlined above, this project would be a landmark example of a more holistic approach to managing water resources for the benefit of the environment, agriculture and local communities. This type of project and approach to water management will be essential if California is to fully implement SGMA, particularly in the face of climate change and a growing population. The recharge element of the Program is expected to raise groundwater levels up to 35 feet in the center of the Program area, and 20-30 feet in other parts of the South American groundwater subbasin - reversing a cone of depression that currently exists due to over-pumping of groundwater. Within 10 years, the program will increase groundwater storage capacity by 245,000 AF and within 25 years it will be increased by 320,000 AF and as much as 450,000 acre-feet in approximately 40 years – which is about half the size of Folsom Lake.

For more information, contact:

Terrie Mitchell
Manager, Legislative & Regulatory Affairs
Sacramento Regional County Sanitation District (Regional San)
10060 Goethe Road
Sacramento, CA 95827
Phone: 916-876-6092
Cell: 916-599-2219
mitchellt@sacsewer.com

REGIONALSAN
TAKING THE WASTE OUT OF WATER
Sacramento Regional County Sanitation District

[16] RMC / WRIME. 2011. *Sacramento Area Integrated Water Resources Model (SacIWRM) Model Development and Baseline Scenarios*. October. Public Document. Available online at: http://woodardcurran.io/pdf/SACIWRM-Report.pdf

List of Contributors/Consultants

- RMC/ Woodard & Curran
- The Freshwater Trust
- CH2M